Amendments to the Drawings

Replacement sheets for Figs. 1, 2, and 3 and copies of the original drawings marked-up in red to identify the amendments are attached. In Figs. 1 and 2, elements 15 that control air consumption now are illustrated. In Fig. 3, the turbine that draws air from receiver 10 is illustrated as present in the blade.

Attachment: Replacement Sheets

Annotated Drawing Sheets

REMARKS

The Amendments

The Specification

The specification has been amended to correct an obvious typographical error and to identify reference numerals for two features described in the specification and appearing on the drawings.

The typographical error appears at page 2, line 27, where "blow" is replaced by --blown--. Applicants respectfully submit that this amendment adds no new matter to the application and earnestly solicit entry thereof.

Reference numerals 15 and 16 have been added at page 3, lines 21 and 22, respectively, to specifically identify on the drawing figures two features that are described throughout the specification. These features are described at page 2, lines 11-28, page 4, lines 30-33, and original claims 5 and 6. Applicants respectfully submit that these amendments add no new matter to the application and earnestly solicit entry thereof.

The Drawings

Replacement sheets for Figs. 1, 2, and 3 and copies of the original drawings marked-up in red to identify the amendments are attached.

In Figs. 1 and 2, elements **15** that control air consumption now are illustrated. The elements are described in the specification at page 2, lines 11-2, page 4, line 30, and in original claim 5. Therefore, Applicants respectfully submit that this amendment adds no new matter to the application and earnestly solicit entry thereof.

In Fig. 3, the turbine that draws air from receiver 10 is illustrated as present in the blade. The turbine is described in the specification at page 2, lines 27-28, page 4, lines 32-33, and original claim 6. Therefore, Applicants respectfully submit that this amendment adds no new matter to the application and earnestly solicit entry thereof.

Claims

Claims 2-4 have been amended to substitute the phrase --the low pressure receiver-- for the word "it" to more particularly point out and distinctly claim the subject matter Applicants regard as the invention. These amendments are supported by the original claims and by the specification, particularly at page 8, lines 28-31. Applicants respectfully submit that these amendments add no new matter to the application and earnestly solicit entry thereof.

Claim 5 has been amended to substitute the phrase --wind energy device-- for "WED" in two places, in accordance with the suggestion in the office action. These amendments, which more particularly point out and distinctly claim the subject matter Applicants regard as the invention, are supported by the original claim and throughout the specification, particularly page I, line 6. Applicants respectfully submit that these amendments add no new matter to the application and earnestly solicit entry thereof.

The Abstract

The abstract has been amended to conform to United States Rules of Practice regarding the number of words therein. Applicants respectfully submit that this amendment adds no new matter to the application and earnestly solicit entry thereof.

The Office Action

The office action noted that only the English-language document on the Information Disclosure Statement filed June 29, 2005, was considered because no English-language translations, abstracts, or equivalents were provided for those documents that are not in the English language.

The oath was objected to as informal.

The drawings were objected to because the view numbers are not larger than the reference characters (37 C.F.R. § 1.84(u)(2)) and because not every feature recited in the claims was identified on the drawings (37 C.F.R. § 1.83(a)). "[E]lements for controlling the consumption of air" of claim 5 and the "turbine" of claims 6 and 11 were not shown on the drawings.

The Abstract was objected to as it exceeded 150 words.

Claim 5 was objected to, as WED, a term defined in the specification, was identified as informal.

Claims 2-4, 7, and 12 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. In claims 2-4, 7, and 12, suction from a receiver into the environment is said to be the opposite of what is disclosed in the specification. In claims 7 and 12, blowing air and the phrase "air is blown" are implicated in this rejection.

On the merits, claims 1, 5 (subject to correction of "WED"), and 6 stand allowed. Claim 11 would be allowable if re-written in independent form.

Claims 8-10 and 12 stand rejected under 35 U.S.C. § 102(b) as anticipated by Somerville, GB 2 186 033.

The Prior Art

Somerville is directed to a wind turbine in which each blade of the turbine rotor has a longitudinally-extending pathway having an inlet on the inner (lengthwise) part of the blade through which air can enter and flow through the pathway and an outlet located adjacent and substantially parallel to the leading edge of the blade at the outer (lengthwise) part of the blade. The inlet may extend over the inner 5 percent to 35 percent of the blade radius, and the outlet extends over the outer 80 percent to 98 percent of the blade radius.

The outlet is adapted to direct air flowing from the pathway over the blade surface towards the trailing edge of the blade. Flow through the pathway may also comprise flow supplied by the rotor hub and may be controlled by a valve. Flow guides also may be provided at the outlet. These are placed transverse to the air flow in the blade, i.e., parallel to the travel path of the blade tip.

The air is discharged on the blade surface at the outer end, for the purpose of increasing the blade's lift force by creation of a lower pressure local zone by operation of the Coanda effect. That flow of air adheres to the blade surface (the Coanda effect) and therefore induces air flowing over the surface to accelerate. This enhances the aerodynamic lift experienced by the blade. Thus, the Coanda effect is used to increase blade lift by creating a local low-pressure zone on the blade surface by blowing the air out of the slots onto the blade surface.

The Invention

The invention, as reflected in claim 8, is directed to a method of enhancing the effectiveness of operation of a rotor blade in a wind energy device. The blade is in the form of a wing with a thick aerodynamic profile and has a vortex system for control of the boundary layer.

The vortex system consists of longitudinal cavities, and is arranged on the rear part of the blade from the side opposite the wind. Suction withdrawal of air to the end of the blade is carried out by centrifugal forces of the rotating blade and by the pressure differences occurring at the blade shank and the end of the blade, because of the high sum speed of the air at the end of the rotating blade. The inlet and outlet for air flow can each independently extend the length of the blade, and air is discharged not only within the blade length but also from the end of the blade.

The Invention in view of the Prior Art

Claims 1, 5 (subject to correction of an informality), and 6 have been allowed. Claim 11 would be allowable if re-written in independent form. Further, as claims 2-4 and 7 depend from allowed claim 1, these claims also are allowable on the merits.

The Information Disclosure Statement filed herewith includes English-language translations or summaries of at least the relevant portions of foreign-language documents identified in an earlier Information Disclosure Statement. Applicants respectfully request that these documents now be considered.

A new oath/declaration is filed herewith.

The drawings have been amended to ensure that the view numbers are larger than the reference characters. The drawings also have been amended to illustrate two features described in the specification and recited in the claims. Applicants respectfully traverse this objection

The Abstract has been amended to ensure that it does not exceed 150 words. Applicants respectfully traverse this objection.

Claim 5 has been amended to correct an informality in the wording. Applicants respectfully traverse this objection.

Claims 2-4, 7, and 12 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to be enabled. Claims 2-4 have been amended to clarify the claims to reflect that "it" was --the low pressure receiver--. The office action asserts that suction from a receiver into the environment is the opposite of the disclosure. In claims 7 and 12, phrases relating to 'blowing' air are implicated in this rejection.

Applicants respectfully traverse this rejection. To the extent this rejection relies on the word "it," Applicants respectfully traverse the rejection in view of the amendment of these claims to substitute --the low pressure receiver-- for "it".

This rejection appears to be based on the description that includes "suction from the environment into the receivers." The office action asserts that sucking air from the receiver into the environment is the opposite of the disclosure. Applicants respectfully traverse this rejection, as there is no inconsistency. The specification describes air flowing from the blade and exiting into the environment by being sucked into the environment. *See*, for example, the paragraph beginning at page 4, line 17. Thus, Applicants respectfully submit that consistent language is used throughout to describe and claim the invention.

As set forth at page 4, lines 33-34, "A turbine for suction withdrawal of air may be additionally mounted in the device, and blowing the air may be carries out into a vortex rotating in the cavity in the blade." Page 2, lines 27-28, has a similar description: " ... [a]ir blow[n] is carried out into the vortex rotating in the cavity of the blade." The skilled practitioner thus can make and use the claimed invention. Thus, Applicants respectfully traverse this rejection.

Applicants respectfully traverse the sole rejection on the merits, i.e., the rejection of claims 8-10 and 12 under 35 U.S.C. § 102(b) as anticipated by Somerville. Applicants respectfully submit that Somerville does not disclose the claimed invention. In particular, the claimed invention provides a method for enhancing the effectiveness of a rotor blade on a wind energy device. Air layers in the boundary layer on the blade surface are suctioned into a vortex that rotates in the cavity in the blade, with subsequent suction of air from the rotating vortex through the air intakes of the longitudinal cavities (claim 8) or cavities' air intakes (claims 9), with the air being discharged at the end of the blade. The stability of the vortex in the cavity determines the effectiveness of suction on the air layers in the boundary layer on the blade surface.

In a first distinction, Applicants respectfully submit that the claimed invention affords the possibility of sucking air off the blade surface along the entire blade length, not just in the range of 5 percent to 35 percent of the blade length, as Somerville is limited. Importantly, the claimed invention also allows air removal from the blade surface in the 60 percent to 99 percent length at the end of the blade, as measured from the blade root. Thus, the claimed invention allows a condition not allowed in the prior art document (Somerville). Improved effectiveness of operation of a rotor blade in a wind energy device comes from ensuring that air flows across the entire blade surface without breaking off. Further, in the claimed method, air is discharged from the end of the blade into the environment, which discharge is precluded in Somerville.

Importantly, the claimed invention does not increase the lift force by creating a local pressure decrease on the blade surface when air is blown-in along the blade surface at the end of the blade (80-98 percent zone). Rather, claim 8 is directed to a method for effective control of

the flow in the boundary layer with the use of suction of the air off the blade surface into the vortex rotating in the cavity disposed on the blade surface at the rear portion of the surface on the leeward, along the blade axis. Further, in the claimed method, air off the blade surface is not sucked into slots. Rather, it is sucked into the vortex rotating in the cavity.

This point raises an important second distinction. In the claimed method, air in the boundary layer of the blade surface, having entered the longitudinal cavity disposed along the blade axis on the blade rear surface, on the leeward, creates the rotating vortex in the cavity. The air then moves through the cavity or the air pathway (claim 9) towards the blade end under the action of centrifugal forces generated by the rotating blade and by the pressure difference between the root end of the blade and the opposite end of the blade.

The vortex rotating in the cavity has a lower pressure than the pressure in the boundary layer on the blade surface and the structure defined by the cavity size. The vortex sucks slowed air layers from the air boundary layer on the blade surface. The effectiveness of this method of air suction, properly applied, approaches that of the distributed perforated suction of air off the blade surface, but delivers this improvement with significantly lower energy expenditure.

A third distinction exists between the disclosure of Somerville and the claimed method. In Somerville, the air sucked off the blade surface at the 5-35 percent of the length portion of the blade is blown out on the blade surface at the 80-98 percent of the length portion of the blade. In the method of claims 8-12, the air is discharged at the blade end beyond the blade.

Somerville creates a low-pressure zone using the Coanda affect. In contradistinction, in the method of claims 8-12 of the pending application, the air is discharged in the blade end

beyond the blade into the zone of lower bottom pressure to provide effective suction of the air off the blade surface.

Although claims 10 and 12 are allowable for the same reasons claims 8 and 9 are allowable, there exist independent reasons why these claims are allowable on their own merit.

In Somerville, flow guides are positioned on the blade surface to ensure that air leaving the blade interior is directed toward the back of the blade. In the method of claim 10, the plates, which serve to restrict streaming-down of the air flow along the blade, are arranged on both the blade surface and within the vortex cavities.

The method of claim 10 also provides for air suction into the vortex cavities, not into the slots on the blade surface as in Somerville. Thus, cavity sizes along the blade axis are restricted where plates are installed. These restrictions allow the cavity to have a stably rotating vortex therein. The vortex in turn sucks the slowed air boundary layer into the low-pressure receiver. The air then is sucked through the air pathway to the blade end under the action of centrifugal forces.

Claim 12, although allowable for the same reasons claim 8 is allowable, also has independent points of argument. These arguments also apply to claim 7. In the method of claim 12, the air is blown into the vortex rotating in the cavity to increase kinetic energy and improve the stability of the vortex. This affords the opportunity to achieve an ejection effect when the high-speed air is blown into the cavity. This air becomes the ejecting flow, and the air that flows in the vortex rotating in the cavity is the ejected flow.

Many devices are capable of achieving the blowing of air into the vortex rotating in the cavity. Air is blown into cavities at the middle and end of the blade. High-energy air flow was

sucked from the cavities in the first part of the blade (at the root end) is used for blowing the ejecting air flow into the vortex rotating in the cavity. The high energy is achieved as a result of the speed of the blade and centrifugal forces.

Blowing of air into the vortex also can be done using a turbine. The turbine sucks air from the cavities or low-pressure receivers disposed in the first half of the blade.

CONCLUSION

Applicants respectfully submit that the claims are in condition for allowance. The prior art, whether considered individually or in combination as proposed, neither suggests nor discloses the method claimed in the pending application. Therefore, Applicants solicit favorable action on the claims.

Respectfully submitted,

BANNER & WITCOFF, LTD.

Dated: January 9, 2007

By: William J. Fisher

William J. Fisher
Registration No. 32,133

1001 G Street, N.W.
Washington, D.C. 20001-4597
Tel: (202) 824-3000
Fax: (202) 824-3001

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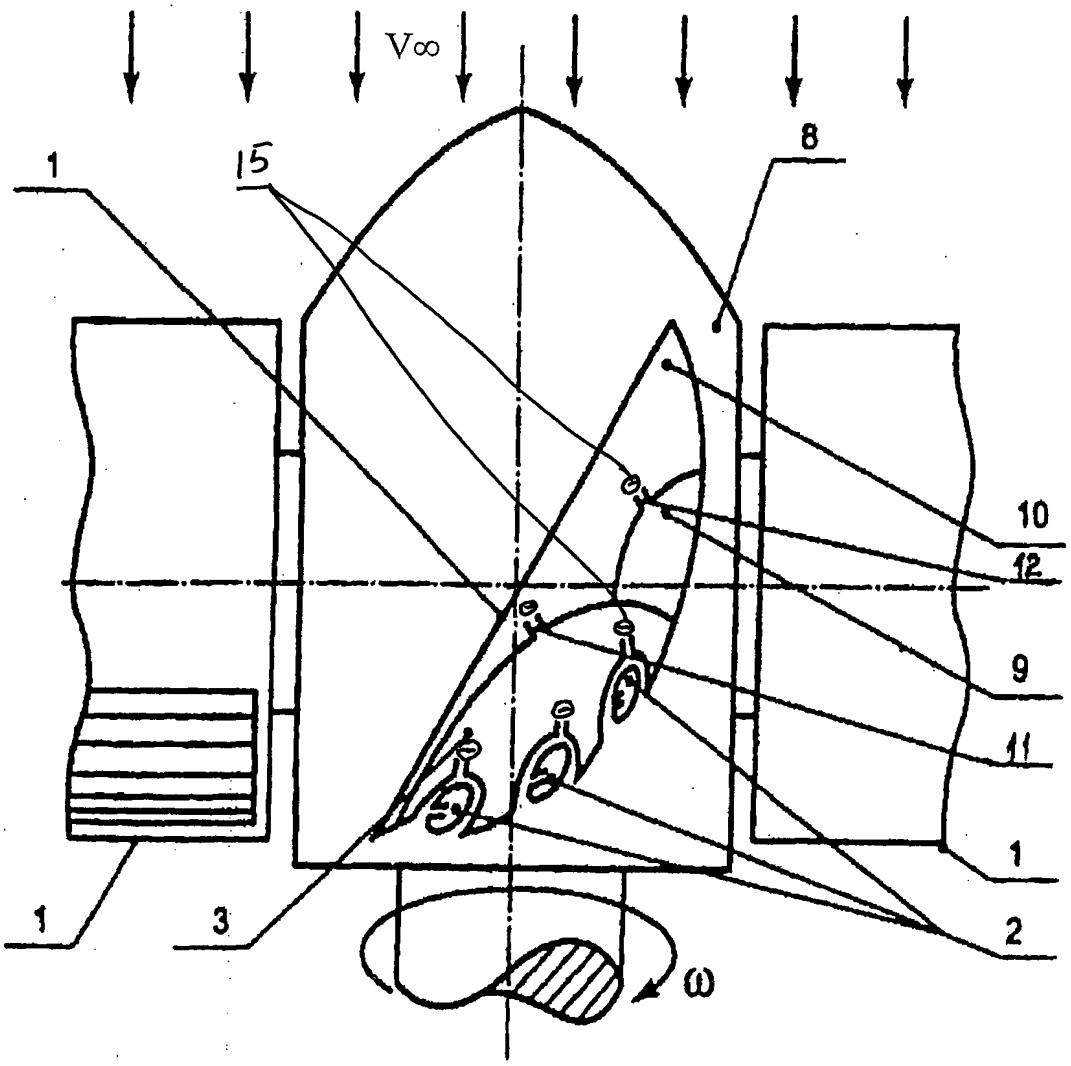

FIG. 1

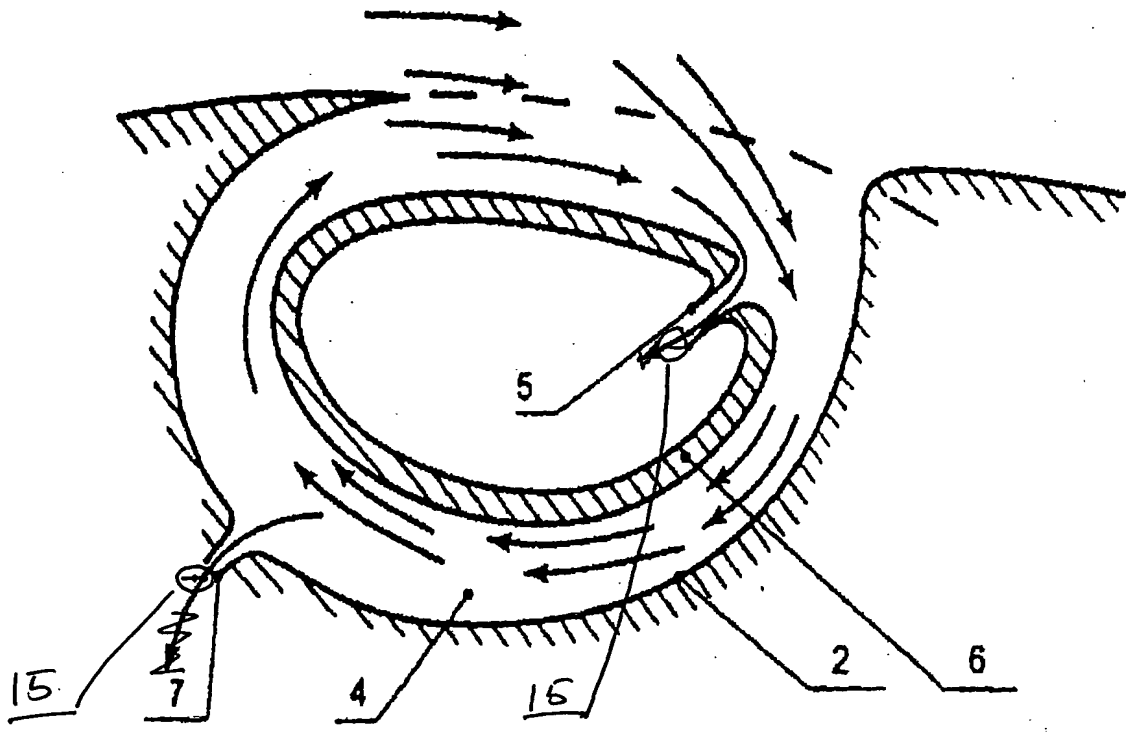

FIG. 2

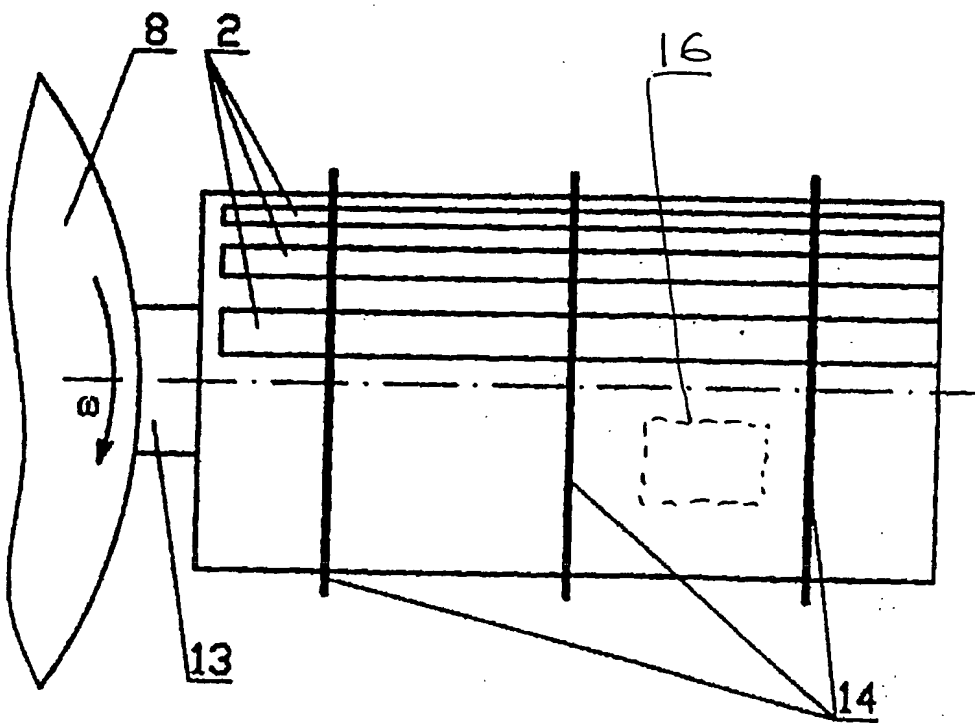

FIG. 3